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# Complementary taphonomies: Medieval sturgeons from Hungary

László BARTOSIEWICZ<sup>(1)</sup> and Clive BONSALL<sup>(2)</sup>

**Résumé.** Cet article concerne l'exploitation des poissons de la famille des Acipensérédés en Hongrie durant le Moyen Âge. En raison de leur taille généralement importante et de leur grande valeur halieutique, les esturgeons ont joué un rôle de premier ordre dans les cultures des communautés de pêcheurs depuis la Préhistoire. La discussion porte sur les problèmes de conservation très particulière touchant les os d'esturgeon et les mentions dans les sources écrites hongroises, plus nombreuses, relatives à ce « poisson royal ».

**Mots-clés.** Acipensérédés, taphonomie, pêche médiévale, ressources littéraires, Danube, Hongrie.

**Abstract.** This is a review of the Medieval exploitation of Acipenserids in Hungary. Owing to their generally large size and high value these fish have been central to fishing cultures since Prehistory. The focus of discussion is the contradictory preservation of sturgeon remains (large but mostly porous bones) and the relative overrepresentation of this "Royal fish" in the scarce written record in Hungary. Both sources are reviewed in taphonomic terms and evaluated from an ichthyological point of view.

**Keywords.** Acipenseridae, taphonomy, Medieval fishing, written sources, Danube, Hungary.

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## Introduction

Owing to their size as well as high economic and status value Acipenseridae have played a central role in many cultures along the Danube since prehistory. Historically, five species may be reckoned with in the modern-day territory of Hungary (in order of decreasing total length): great sturgeon (*Huso huso*: 2-3 m, sometimes 10 m), Russian sturgeon (*Acipenser gueldenstaedti*: 2-2.5 m), ship sturgeon (*Acipenser nudiiventris*: 2 m), stellate sturgeon (*Acipenser stellatus*: 1.5-2 m) and sterlet (*Acipenser ruthenus*: 1-1.2 m). Except for sterlet, all are anadromous. These

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Settlement name	Dating	Type
1. Győr-Ece	11 <sup>th</sup> -13 <sup>th</sup> c.	rural
2. Sárszentlőrinc-Birkajárás	14 <sup>th</sup> c.	manorial
3. Zirc-Cistercian Monastery, S Wing	15 <sup>th</sup> c.	monastic
4. Esztergom-Vár	11 <sup>th</sup> -13 <sup>th</sup> c.	castle
5. Pilisszentkereszt-Cistercian Abbey	14 <sup>th</sup> -15 <sup>th</sup> c.	monastic
6. Visegrád-Vár	15 <sup>th</sup> c.	castle
7. Óbuda-Clarissan Monastery	15 <sup>th</sup> c.	monastic
8. Buda-Vár	14 <sup>th</sup> -16 <sup>th</sup> c.	castle
9. Buda-Vár, Dominican Monastery	14 <sup>th</sup> -15 <sup>th</sup> c.	monastic
10. Buda-Vár, N Courtyard	14 <sup>th</sup> -15 <sup>th</sup> c.	castle
11. Buda-Teleki Palace, Well 8	14 <sup>th</sup> -15 <sup>th</sup> c.	urban
12. Buda-Vár, Csikós udvar	16 <sup>th</sup> -17 <sup>th</sup> c.	urban
13. Buda-Rác-fürdő	16 <sup>th</sup> c.	rural
14. Vác-Zeneiskola	16 <sup>th</sup> -17 <sup>th</sup> c.	urban
15. Szendrő-Upper Castle	17 <sup>th</sup> c.	castle

**Fig. 1.** *Medieval assemblages with Acipenserid bones from Hungary.*

species are osteologically similar; however, selective preservation poses one of the greatest problems in their evaluation. The representation, chiefly of great sturgeon, the “Royal fish”, is better in otherwise scanty Medieval/Early Modern Age documents in Hungary. In this paper, both types of sources are reviewed in *latosensu* taphonomic terms, comparing their relevance to reconstructing procurement and consumption.

## Material and Method

Remains of large sized Acipenserid fish are considered from 14 Medieval sites in the territory of modern-day Hungary (fig. 1).

Owing to their rare occurrence and the problems of quantification Acipenserid remains (usually at most 2-3 per site, even in large assemblages) will only be discussed in terms of presence/absence in this study, rather than fragment numbers or minimum numbers of individuals (these latter would correspond to “presence=1” in most cases).

## Bone preservation and recovery

Although remains from such large fish should be recovered with great probability, the chances of survival for bones decrease with size in Acipenserids (especially great sturgeon) since skeletal resorption exceeds bone formation during aging. Thus, paradoxically, the bones of the largest specimens tend to be most easily destroyed or eroded beyond identifiability in archaeological deposits. Evidence of sturgeons, therefore, tends to be underrepresented at many sites. On the other hand, the good visibility of surviving large bones guarantees recovery

even without sieving. Denticles, compact dermal scutes and fragments of the robust pectoral fin ray occur most commonly in hand-collected assemblages. The proximal width of pectoral fin rays can be used in estimating the age/size of sturgeon (Desse-Berset, 1994). The scutes, showing specific surface patterning, are arranged in four rows along the body, and differ both in size and shape by anatomical location. Species-level identification is limited to a few special elements (Brinkhuizen, 1986), but large Acipenserids must have provided comparably large amounts of meat. Rare cases of precise species identification will not be discussed in this paper, although the remains of the smallest Acipenserid species, sterlet, were not considered in the overall evaluation.

## Meat output

The special value of great sturgeon (on average 80-100 kg, but sometimes much more) is indicated by a 1329 entry in the customs record from Zsolca, a crossing point on the Sajó river in north-east Hungary: while a toll of 2 Denarii was collected per great sturgeon, only a Denarius had to be paid for other Acipenserids (the same as for a horse, ox or cow; Tóth, Kubinyi, 1996, p. 320-321). Meanwhile, small-bodied sterlet (not included in the maps of this study) and stellate sturgeon tended to be more highly appreciated for the quality of their meat (Bendaf, 2005, p. 246).

The live weight of a great sturgeon rivalled or even surpassed that of a large pig. It is thus evident that the scanty osteological evidence represents considerable quantities of high quality meat, although a size decrease in common sturgeon (*Acipenser sturio*), attributable to overfishing, has already been detected in 8<sup>th</sup>-12<sup>th</sup> century Ralswiek (Germany) and in 10<sup>th</sup>-13<sup>th</sup> century Gdańsk (Poland; Benecke, 1986, p. 9-17). Since 1800, an estimated 1.84 kg – statistically significant – mean annual decrease took place in record size sturgeons in Hungary (Bartosiewicz, Takács, 1997, p. 9). However, even 20<sup>th</sup> century records (Khin, 1957) show favourable parameters (fig. 2).

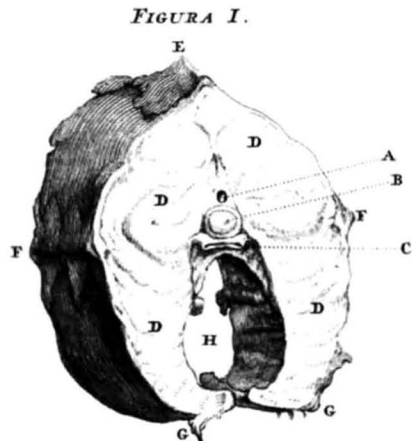
The high proportion of meat to bone in the trunk of great sturgeon may be easily appraised in a drawing (fig. 3) published by Marsigli (1726) in his monograph on the Danube.

In addition, the value of these fish was further increased by highly appreciated caviar. Unfortunately, no archaeological evidence for this important substance can be hoped for (even sexing of sturgeon bones is impossible).

Year	Catch site	Live weight	Carcass weight	Dressing %
1922	Gemenc	90	70	70.0
1957	Paks	138	100	72.0
1987	Paks	181	100*	55.2*

\*Pure meat with spine but without skin.

**Fig. 2.** The meat output of modern record size sturgeons from Hungary.



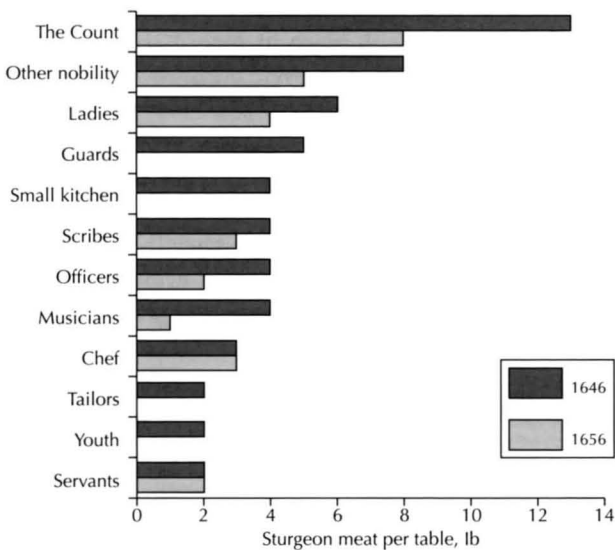
**EXPLICATIO SECTIONIS PARVI HUSONIS .**

**Fig. 3.** *The cross section of a sturgeon published by Marsigli (1726).*

Source	Great st.	Ship st.	Sterlet	Caviar	Total
Galgóczi 1622	16 = 9%	12 = 7%	11 = 6%	3 = 2%	42 = 24%
Keszei 1680	19 = 5%	22 = 6%	11 = 3%	3 = 1%	55 = 15%
Kolozsvár 1698*	1			5	3
Fáy 17 <sup>th</sup> c.*	1		1	1	3

\* Manuscript fragments.

**Fig. 4.** *The number of Acipenserid recipes in Hungarian cookbooks. Percentages relate to all fish recipes in the source (after Herman, 1884).*



**Fig. 5.** *Daily rations of great sturgeon in the court of Count Ádám I. Batthyány.*

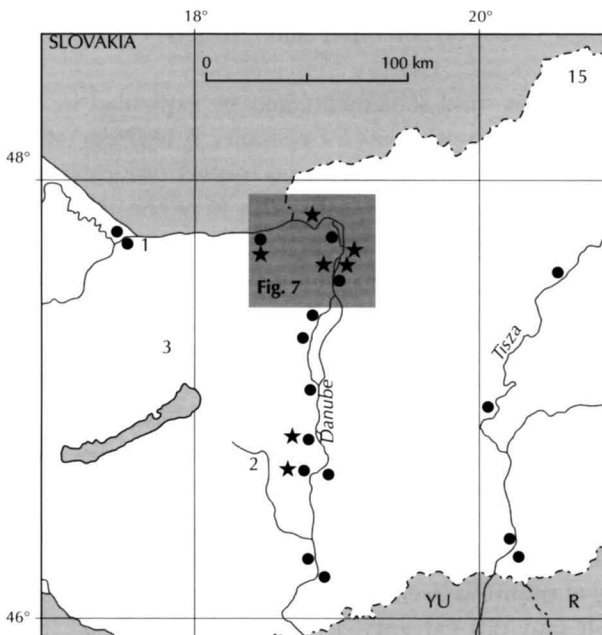
However, a 15<sup>th</sup> century account from an aristocratic military camp lists the purchase of this high-value delicacy (Kubinyi, 2002, p. 249). It is also listed in the first, Early Modern Age cookbooks written in Hungarian, in which Acipenserids are well represented (fig. 4).

The distribution of meat from great sturgeon reflected social ranking within aristocratic households. Daily rations during the 40-day Lent period varied strongly with status in the Németújvár (Güssing, Burgenland) court of Count Ádám I. Batthyány, Member of the Royal Chamber (fig. 5; Benda, 2005, p. 247, table 31).

### Osteological evidence by settlement type

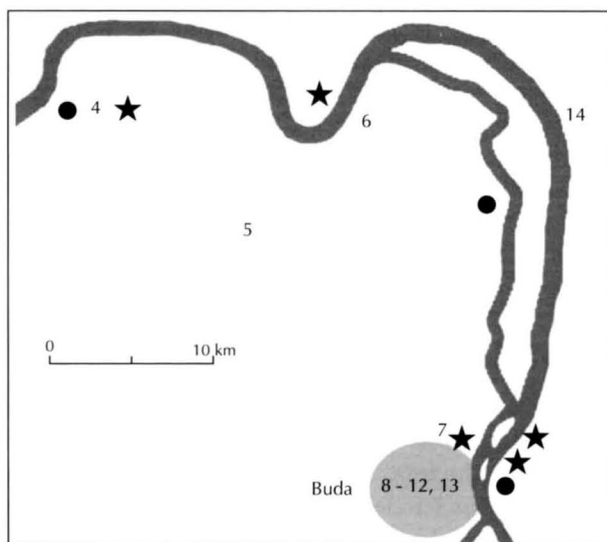
The geographical distributions of finds under discussion here are shown in figures 3 and 4 whose site codes listed in table 1 (# No.) are used for reference throughout the text. Both maps also show catch sites of 19<sup>th</sup>-20<sup>th</sup> century record size specimens (circles; Khin, 1957). Their relatively even distribution along the Danube is worth mentioning (fig. 6), especially in light of the concentration of archaeological finds at high status Medieval sites of consumption near the Danube Bend gorge (fig. 7).

While in general “fish” occurs in many faunal lists published previously, detailed species identification was carried out only at 23 sites. Six of these are villages (10<sup>th</sup>-13<sup>th</sup> century: 4, 14<sup>th</sup>-15<sup>th</sup> century: 2), all located in the proximity of either the Danube or the Tisza rivers. However, none of them yielded Acipenserid



**Fig. 6.** The geographical distribution of Medieval large Acipenserid finds (numbers as in table 1) outside the Danube Bend region (insert enlarged in fig. 7) and 19<sup>th</sup>-20<sup>th</sup> century record size sturgeons in Hungary (circles). Known catch sites of sturgeon sold in Medieval Buda are marked by asterisks.

**Fig. 7.** Medieval large *Acipenserid* finds (numbers as in fig. 1) and 19<sup>th</sup>-20<sup>th</sup> century catch sites (circles) in the Danube Bend region. Sources of sturgeon sold in Medieval Buda are marked by asterisks.



bones (Takács, Bartosiewicz, 1998, fig. 7). A pectoral fin ray from the 12<sup>th</sup>-13<sup>th</sup> century village of Győr-Ece (#1; L. Daróczi-Szabó, pers. comm.) should be considered a rarity. At this site, as well as at the 16<sup>th</sup> century village of Buda-Rác-fürdő at the foot of the Buda Castle, it may have been the proximity of catch sites along the Danube that led to the deposition of sturgeon remains. The scute found at the 14<sup>th</sup> century manorial settlement of Sárszentlőrinc-Birkajárás (#3), at a relatively long distance from major rivers, on the other hand, may be considered a luxury item.

The rarity of sturgeon bones at rural settlements may be explained by this high status catch probably having been off limits for peasants. A 1432 document reveals that as the serfs of the Bishop of Eger tried to transport two great sturgeons from his Palkonya fishing grounds to Eger, the fish were confiscated by the officials of Kisfalus village (Tóth, Kubinyi, 1996, p. 279).

The latest sturgeon under discussion here was identified at the Early Modern Age castle of Szendrő (#15) in northern Hungary, far away from major rivers.

As for urban settlements, a single dentale and a dermal scute of ship sturgeon are known from 16<sup>th</sup>-17<sup>th</sup> century Ottoman Period deposits in Vác (#14; Bartosiewicz, 1995). The rest originate from food refuse of the burghers in the Royal Capital of Buda (#10 and 12; Bartosiewicz, 2003; Daróczi-Szabó, pers. comm.). Sturgeons entered the re-distribution system of urban markets. In his 1405 decree, King Sigismund limited the fish selling rights of butchers in Buda markets to large fish, probably in order to protect the interests of the local fisherfolk who sought a monopoly of trading as well (Kenyeres *et al.*, in press: 9). Large *Acipenserids* indubitably fell into this category. It remains unknown whether

butchers were also in charge of dismembering these fish, or re-sold it as major cuts.

It is noteworthy that the remaining nine assemblages yielding Acipenserid bones all originate from high status settlements of some sort. They include the 10<sup>th</sup>-13<sup>th</sup> century royal centre in Esztergom (#4), 14<sup>th</sup>-15<sup>th</sup> century deposits from the subsequent royal capital, Buda (#8-12), and the 15<sup>th</sup> century royal residence in Visegrád (#6). The rest originate from 14<sup>th</sup>-15<sup>th</sup> century monastic centres (#2, 5, 7, 9).

## Market supply and cultural taphonomy

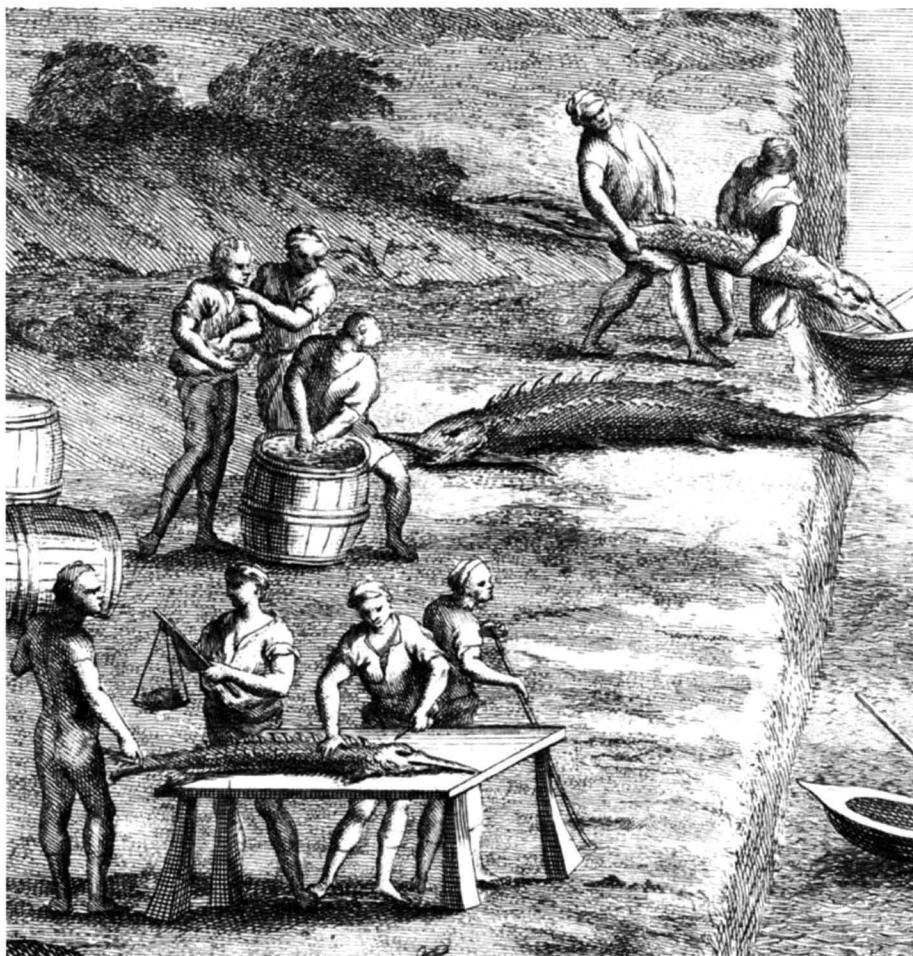
Primary human action must always be reckoned with as an integral and exciting part of archaeozoological biostratigraphy (Bartosiewicz, 2001, table 1). Contemporaneous cultural modifiers are of greatest interest to archaeologists. “Cultural taphonomy”, however, begins with a key factor shaping the archaeological assemblage: the input, i.e. procurement and provisioning. Written sources reveal that sturgeon fishing was a serious trade, practised by specialized fishermen in distinguished, legally protected spots, such as the confluence of the Danube and Vah near the city of Komárom, which was declared Royal Fishing Grounds in 1518 (Khin, 1957). The transport and distribution of the catch, alive or salted (Benda, 2005, p. 253), is also a cultural filter to be considered in the *lato sensu* taphonomic analysis of sturgeon remains.

In figures 3 and 4, the geographical patterns of Medieval sites of consumption and successful 19<sup>th</sup>-20<sup>th</sup> century catch sites along the Danube are markedly different, since the latter are relatively even, probably indicative of local hydrological features that made targeting migrating great sturgeons easier. In addition to investments in sturgeon fishing, shipment and temporary storage may have posed problems thereby contributing to the value of these animals.

Bél (1764, p. 41) describes how large sturgeons were sometimes kept tethered to trees or strong poles on shore, before being towed upstream live by boat to the nearest market. The capitals of Buda and Vienna were supplied with fresh sturgeon in this way.

According to the 1519 Guild Book and Documents of Privilege of the Buda Butchers, sturgeon and ship sturgeon were brought to town from Paks and Földvár downstream from the royal capital. Catch sites upstream included Esztergom, Nagymaros, Megyer, Óbuda and Szentlászló (Kenyeres *et al.*, in press; fig. 4). Unfortunately, this source does not specify the form of transport over relatively great distances. Aside from the aforementioned 18<sup>th</sup> century possibility, primary butchery of these large animals may have taken place as soon as they were landed, and the eviscerated carcasses were possibly salted and packed for shipment. This process is clearly illustrated in Marsigli's 1726 book (fig. 8). Although the scene takes place in the then Ottoman Turkish dominated Iron Gates region of the Danube, the region has had a continuous sturgeon fishing tradition since the Mesolithic. It is difficult to tell where the sturgeons handled





**Fig. 8.** *The on-site primary butchering of sturgeon in the Iron Gates gorge (Marsigli, 1726).*

in this picture were bound, but towing them upstream would have been impossible in the turbulent waters of the Iron Gates Gorge.

Primary butchery on location at the catch site as well as secondary in the place of consumption would have drastically reduced the fragile skeleton of large sturgeons during the biostratinomic process. Cooking, trampling and scavenging further exacerbated the condition of the material. The remaining bones were then additionally eroded during fossil diagenesis within the deposit.

Bones of large Acipenserids are best known from the section of the Danube Bend gorge and the broader Buda municipal region shown in figure 7. Considering the extensive catchment area of the Buda fish market during the Middle Ages, evidently sturgeons from a broader hinterland were concentrated at sites of – usually high status – consumption.

Secondary, i.e. contemporary, human influence in the form of sampling bias must also be reckoned with. Archaeological research has been concentrated at high status sites, where the majority of large Acipenserid remains originate. Fortunately, over two dozen animal bone assemblages from Medieval (10<sup>th</sup>-13<sup>th</sup> century) rural settlements have been studied in Hungary and, with the exception of Győr-Ece (under discussion here) no remains of large sturgeons were found.

## Indirect evidence

Aside from taking advantage of natural features in river beds that decelerated sturgeon migrating upstream and made them prone to human predation, by the Middle Ages special weirs were also constructed on several rivers. These installations, made of timber and sometimes complemented with nets, required major investments in both material and labour. Nicolaus Olahus (1568) even mentions the complete closure of the Danube with such a structure, although a 1528 trial between Vác and Buda shows that this was considered an unfair move. Therefore, to trap fish migrating upstream from the Black Sea, weirs tended to be built in the mouths of smaller tributaries, or between small islands or sandbars and the banks of the mainstream as was observed by Marsigli in the Iron Gates (Bartosiewicz, Bonsall, 2004). Unfortunately, archaeological evidence for such massive structures is yet to be found in Hungary.

In the absence of Medieval osteological evidence, sturgeon fishing along the Tisza river was not discussed here. However, a 1677 legal document from Ónod (located 20 km northeast of the river, on the way towards Szendrő, #15 in fig. 3), for example, guaranteed the privilege of a landlord to the large Acipenserids caught in the river (Benda, 2005, p. 246). This is consonant with a record from the 16<sup>th</sup> century: serfs of entire villages were mobilized to build weirs under the command of the *magister clausurae*, often using massive oak timbers transported from great distances to the plain. Once finished, the serfs were paid in fish, but the sturgeons were all retained by the landlord (Bencsik, 1970).

## Conclusions

In comparison with their preponderance among fish mentioned in the written record, Acipenserid bones are rare at Medieval sites in Hungary. From an archaeological point of view, this may be explained by a shift in the focus of research: catch sites were more likely to coincide with the sites of consumption in prehistoric times, while transport distances probably increased along with urbanization and the emergence of power centres. Data on procurement, provisioning and transport in the Medieval written record are indicative of important taphonomic factors, explaining the spatial discrepancy between catch sites and find spots at special, usually high status settlements. Written sources (legal documents, tax rolls and cook books), however, have their own taphonomy: their

entries as well as chances of physical survival may be very selective. Sturgeons, however, must have stood a better than average chance of being mentioned. Owing to their intrinsically high value, as well as the high level of organization involved in sturgeon fishing, they were often subject to documented fiscal transactions and legal disputes. As high status food that could add to the luxury on Lenten days, they were also an important means of (self) representation for nobility, as is attested by cookbooks, procurement lists and courtly regulations.

The critical integration of archaeo-ichthyological and historical sources under discussion here shows that the technical complexity of sturgeon fishing was matched by the social complexity of superstructures involved in the distribution and, ultimately, consumption of these unique fish. Integrating these two types of evidence from the Middle Ages lends some weight to the idea that prehistoric sturgeon fishing, like that documented for the Iron Gates Mesolithic/Early Neolithic, would also have represented a major community effort that may have been central to the interest of people controlling fishing grounds. Complexities revealed by comparisons between Medieval finds and the written record, however, also warn that beyond general technical statements, these results are of limited explanatory value in the interpretation of prehistoric sturgeon fishing whose cultural background is far more difficult to reconstruct.

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